03-01-00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Rautiainen

Serial No. TO BE ASSIGNED

Corresponding to PCT/FI98/00654, filed 25 August 1998

FEB 2 9 2000

Filed: 29 February 2000   Docket No.: 602.314USW1

Title: PROCEDURE FOR SETTING UP A CALL IN A WIRELESS LOCAL
LOOP

CERTIFICATE UNDER 37 C.F.R. 1.10:
    'Express Mail' mailing number: EL384201546US
    Date of Deposit: ___29 February 2000___
The undersigned hereby certifies that this Transmittal Letter and the paper or fee, as described herein, are being deposited with the United States Postal Service 'Express Mail Post Office To Addressee' service under 37 CFR 1.10 and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231

By: ___Theresa Jurek___

Theresa Jurek

Box Patent Application
Assistant Commissioner for Patents
Washington, D.C. 20231

**REQUEST FOR CONTINUATION OF AN INTERNATIONAL APPLICATION UNDER 37 C.F.R.
§1.53(b)**

This is a request for filing a continuation application under 37 C.F.R. §1.53(b) of prior pending international application number PCT/FI98/00654 filed on 25 August 1998 entitled PROCEDURE FOR SETTING UP A CALL IN A WIRELESS LOCAL LOOP, which designated the United States.

1. ☒ Enclosed is a patent application containing 8 pages of specification, 7 claims and 2 sheet(s) of drawings.

2. ☒ A preliminary amendment is enclosed.

3. ☒ Please amend the specification by inserting the following paragraph after the title:

    This application is a continuation of international application serial number PCT/FI98/00654, filed 1 September 1997.

4. ☐ Small entity status
    a. ☐ A small entity statement is enclosed.
    b. ☐ A small entity statement was filed in the prior non provisional application.
    c. ☐ is no longer claimed.

The filing fee is calculated below
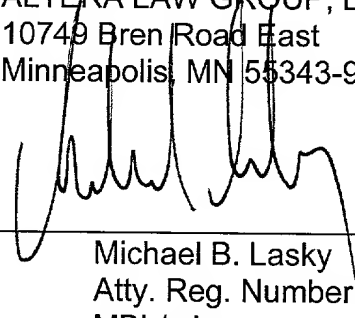
CLAIMS				
	Number Filed	Number Extra	Rate	Fee
Total Claims	7	0	X $18.00	$
Indep. Claims	1	0	X $78.00	$
Multiply Dependent Claims				$
			Basic Fee	$ 690.00
			TOTAL	$ 690.00

5. ☒ Payment of filing fees
   ☐ A check in the amount of   is enclosed.
   ☐ Please charge Deposit Account Number 50-1038.
   ☒ Is deferred.

6. ☒ The Commissioner is hereby authorized to credit any overpayment or charge any fees required under 37 C.F.R. §1.16-1.18 to Deposit Account Number 50-1038.

7. ☒ The priority of Finnish application number 973579, filed 1 September 1997, is claimed under 35 U.S.C. §119.

8. ☒ An unsigned Declaration is enclosed.

9. ☐ An assignment of the invention to   , Recordation Form Cover Sheet (Patents Only) and a check in the amount of $40.

10. ☐ An Information Disclosure Statement, Form PTO 1449 and copies of   citations are enclosed.

11. ☒ Correspondence Address

Altera Law Group
10749 Bren Road East
Minneapolis, Minnesota 55343

12. ☒ Address all correspondence to Michael B. Lasky.

13. ☐ Also enclosed:

14. ☒ A return postcard is enclosed.

Respectfully submitted,

ALTERA LAW GROUP, LLC
10749 Bren Road East
Minneapolis, MN 55343-9056

Dated: 29 February 2000

Michael B. Lasky
Atty. Reg. Number 29,555
MBL/mka

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Rautiainen	Serial No.:	UNKNOWN
Filed:	CONCURRENT HEREWITH	Docket No.:	602.314USW1
Title:	PROCEDURE FOR SETTING UP A CALL IN A WIRELESS LOCAL LOOP		

PRELIMINARY AMENDMENT

Box Patent Application
Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

Please enter the following preliminary amendment into the above-referenced

application.

ABSTRACT

Please insert the attached abstract into the application as the last page thereof.

CLAIMS

Please amend the claims as follows:

In claim 4, line 1, please remove "or 3".

In claim 5, lines 1-2, please replace "in any one of claims 2-4" with –in claim 2--.

In claim 6, lines 1-2, please replace "in any one of claims 1-5" with –in claim 1--.

In claim 7, lines 1-2, please replace "in any one of claims 1-5" with –in claim 1--.

REMARKS

The above preliminary amendment is made to insert an abstract page into the application and to remove multiple dependencies from the following claims: 4, 5, 6, and 7.
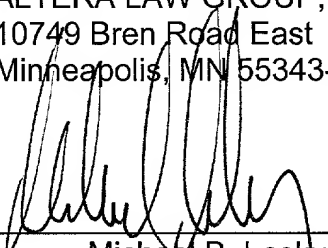
Applicant respectfully requests that this preliminary amendment be entered into the record prior to calculation of the filing fee and prior to examination and consideration of the above-identified application.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicant's attorney of record, Michael B. Lasky at (612) 912-0527.

Respectfully submitted,

ALTERA LAW GROUP, LLC
10749 Bren Road East
Minneapolis, MN 55343-9056

Dated: 29 February 2000

Michael B. Lasky
Atty. Reg. Number 29,555
MBL/mka

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PROCEDURE FOR SETTING UP A CALL IN A WIRELESS LOCAL LOOP

The present invention relates to a procedure as defined in the preamble of claim 1.

5   In a wireless local loop (WLL, Wireless Local Loop or RLL, Radio in Local Loop), a terminal unit is connected via a wireless link to an access node (AN). The access node may consist of multiplexers, crossbar switches and various transmitting systems. The WLL

10   system may be based e.g. on technology used in mobile telephone systems, such as the GSM/DCS1800 technology (GSM, Global System for Mobile Communications; DCS, Digital Cellular System). GSM is a European digital mobile communication system standardised by ETSI. DCS-

15   1800 is a mobile communication system standardised by ETSI, which is based on the GSM specification and aims at a more effective use of microcells and which works in the frequency range of 1800 MHz. Between the terminal unit and the access node there is a base trans-

20   ceiver station, through which call signals received from the terminal unit over a radio channel are transmitted via the access node to a public telephone network and vice versa. The access node can be connected to the telephone exchange using e.g. a V5.2 protocol

25   consistent with the ETS 300 347-1 standard or a V5.1 protocol consistent with the ETS 300 324-1 standard. The access node functions as a converter between GSM signalling and V5 signalling.

    During call setup in a local loop, various

30   checking functions related to network security management are carried out. The checking functions are designed to prevent illicit access to the network for users who have no right to use it, and to prevent the use of e.g. a mobile station reported stolen. The

35   checking operations defined by the GSM specifications, carried out during call setup, retard the call setup

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process so that the VS signalling time-outs are
tripped and the call must be disconnected even though
it is most likely to be successful. In a wireless lo-
cal loop, fast setup of an outgoing call is particu-
5   larly important.

An operation retarding call setup is e.g.
change of the subscriber identity code (TMSI realloca-
tion), which means changing the temporary subscriber
identity code assigned for the subscriber by the visi-
10   tor location register and allowing confidential sub-
scriber identification e.g. during the call. Another
check retarding call setup is the verification of the
subscriber's access right, i.e. subscriber authentica-
tion, which means checking the subscriber data of a
15   mobile station and preventing illicit access to the
network. A third check retarding call setup is the
verification of the subscriber's equipment identity
code (IMEI check). To check the equipment identity
code, it is compared with a register of equipment
20   identity codes of mobile stations reported stolen
and/or defective. IMEI is an international mobile sta-
tion equipment identity code, by means of which a mo-
bile station can be unambiguously identified.

Especially the time-outs in the PSTN protocol
25   in the VS interface (standard ETS 300 324-1 1 13)
cause problems in call setup in a wireless local loop
system. For instance, in the case of a terminating
call, the time-out according to the VS PSTN protocol
between the start message and the acknowledgement mes-
30   sage (the telephone rings) is max. 4 seconds (standard
ETS 300 324-1 13.6).

The object of the present invention is to
eliminate the drawbacks described above.

A specific object of the invention is to pre-
35   sent a procedure that can be used to accelerate call
setup so that unnecessary tripping of time-outs and
needless disconnection of calls are avoided and the

time available for the signalling needed for the call
setup itself is increased.

The procedure of the invention is character-
ised by what is presented in claim 1.

5   According to the invention, to accelerate
call setup, checking functions are performed during
voice mode connection of the call instead of being
performed during call setup. The invention provides
the advantage that more time is made available for the
10   signalling needed for call setup while possible trip-
ping of time-outs and unnecessary disconnection of the
call are avoided.

In an embodiment of the procedure, sub-
scriber's terminal units are connected to an access
15   node via a radio link consistent with the GSM specifi-
cation and checking functions are carried out, said
functions comprising change of the subscriber identity
code (TMSI reallocation), verification of subscriber
authenticity (authentication) and/or verification of
20   the subscriber's equipment identity code (IMEI check).

In an embodiment of the procedure, the change
of the subscriber identity code is TMSI reallocation
consistent with the GSM 04.08 4.3.1. standard.

In an embodiment of the procedure, the veri-
25   fication of subscriber authenticity is an authentica-
tion consistent with the GSM 04.08. 4.3.2 standard.

In an embodiment of the procedure, the veri-
fication of the subscriber's equipment identity code
is an IMEI check consistent with the GSM 04.08. 4.3.3
30   standard.

In an embodiment of the procedure, the V5 in-
terface is a V5.2 interface consistent with the ETS
300 347-1 standard.

In an embodiment of the procedure, the V5 in-
35   terface is a V5.1 interface consistent with the ETS
300 324-1 standard.

The figure presents a signalling diagram rep-
resenting a call originated by a terminal unit TU in a
wireless local loop and substantially corresponding to
a mobile-originated call MOC consistent with the GSM
5   specifications. The system components in the diagram
are a base transceiver station BTS, an access node AN,
i.e. a node of an access network, and a local exchange
LE.

The access node AN has three program segments
10 called registers. These are an equipment identity reg-
ister, an authentication register and, hierarchically
above these, a visitor location register. The equip-
ment identity register contains the international mo-
bile station equipment identity numbers (IMEI). An
15 equipment identity number may be placed on a white,
grey or black list, and in response to an IMEI check
the equipment identity register returns the list col-
our of the IMEI concerned. The authentication register
produces the triplets needed in authentication and
20 contains the data required for authentication. The
functions of the visitor location register include
making the decision about carrying out the checks.

In the GSM/DCS world, the following register
terms are used: authentication centre AUC; AC, equip-
25 ment identity register EIR and visitor location regis-
ter VLR. In conjunction with a wireless local loop,
the visitor location register is designated WFR
(wireless fixed register).

Call setup in a wireless local loop in the
30 so-called non-transparent mode as presented in the
figure is substantially identical with call setup in a
conventional GSM system. In a wireless local loop sys-
tem, the access node AN also comprises functions that
are included in the mobile switching centre/visitor
35 location register MSC/VLR and home location regis-
ter/authentication centre/equipment identity register
(HLR/AC/EIR) of an ordinary GSM system. In a wireless

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local loop, the subscriber terminal units communicate
with the access node AN by radio. The signalling be-
tween the terminal unit and the access node AN is mes-
sage based signalling consistent with the GSM specifi-
5   cations (GSM/DCS). The access node AN is connected to
a wired network local exchange LE via a V5.2 interface
consistent with the ETS 300 347-1 standard.

When the subscriber picks up the receiver,
the terminal unit generates a local dial tone. The
10 subscriber has a predetermined period of time to dial
the first digit. The dial tone goes out as soon as the
first digit has been dialled. The item numbers below
correspond to the numbering in the figure.

1. Call setup is started upon the lapse of a
15 predetermined period of time after the last digit has
been dialled. The terminal unit TU requests a call by
sending a CHANNEL REQUEST message to the base trans-
ceiver station BTS.

2. The base transceiver station BTS transmits
20 a CHANNEL_REQUIRED message to the access node AN,
which starts a search to find a communication channel.

3. After a communication channel has been
successfully allocated, the access node AN activates
the channel by sending a CHANNEL ACTIVATION message to
25 the base transceiver station BTS.

4. The base transceiver station acknowledges
activation by returning a CHANNEL ACTIVATION ACK mes-
sage. The base transceiver station BTS starts trans-
mission and reception on this channel using the power
30 and timing data received in this message.

5. After the communication channel has been
successfully activated, the access node AN sends an
IMMEDIATE ASSIGNMENT COMMAND message to the base
transceiver station BTS.

35   6.   This   message   contains   an   IMMEDIATE
ASSIGNMENT message, which the base transceiver station
BTS sends to the terminal unit TU.

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7. Having received the IMMEDIATE ASSIGNMENT message, the terminal unit TU is tuned to the specified communication channel and starts setting up a signalling link over the network. The terminal unit TU
5   sends a layer-2 SABM message to the base transceiver station BTS via the communication channel. The SABM contains a layer-3 service request message.

8. The base transceiver station sends the service request of the terminal unit further to the
10 access node AN in an ESTABLISH INDICATION message, which includes the subscriber's temporary mobile subscriber identity (TMSI) code.

9. The base transceiver station BTS acknowledges the SABM message by sending a UA frame to the
15 terminal unit TU.

10. The access node finds the subscriber's L3 address (using the TMSI and IMSI) and checks the state of the corresponding V5 interface. If call setup is allowed, the access node AN sends an ESTABLISH message
20 to the local exchange LE.

11. At the same time, the access node AN starts encryption by sending an ENCRYPTION COMMAND message to the base transceiver station BTS. The base transceiver station BTS analyses the command. If en-
25 cryption is needed, the base transceiver station BTS activates a demodulator for the deciphering of the encryption.

12. If encryption is used, the base transceiver station BTS sends a CIPHERING MODE COMMAND mes-
30 sage to the terminal unit TU.

13.-14. The local exchange LE sends to the access node AN an ALLOCATION message, which contains the time slot used in the V5.2 interface. The access node AN acknowledges this by sending an ALLOCATION
35 COPMLETE message to the local exchange LE.

15. After receiving the CIPHERING MODE COMMAND message, the terminal unit TU starts encryp-

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tion deciphering and ciphering using an available ci-
phering key and returns to the base transceiver sta-
tion BTS, in ciphered form, a CIPHERING MODE COMPLETE
message or the next message it is to send. Upon re-
5   ceiving the CIPHERING MODE MOMPLETE message (or any
layer-2 frame correctly ciphered), the base trans-
ceiver station BTS starts encryption and transfers the
message transparently to the access node AN.

16. When the local exchange LE is ready to
10   receive a dialled number, it sends an ESTABLISH ACK
message to the access node AN. A connection between
the access node AN and the local exchange LE is set up
and the speech path is connected through.

17. The terminal unit TU starts call setup by
15   a SETUP message, which contains e.g. the number of the
called subscriber and the call type (voice/data). The
access node AN checks in the VLR/HLR database whether
call setup is allowed for the subscriber. If the right
conditions are fulfilled, then the access node AN
20   sends the DTMF (dual tone multi-frequency) numbers
(together with the VS messages) to the local exchange
LE.

18. Having sent the numbers, the access node
sends a CALL PROCEEDING message to the terminal unit
25   TU, indicating that the call is under processing.

19.-22. The channel mode is changed from sig-
nalling to voice via a "mode modify" procedure. First,
the access node AN sends a MODE MODIFY message to the
base transceiver station BTS to change the channel
30   mode. Synchronisation by a transcoder begins. After
receiving a MODE MODIFY ACK message, the access node
starts the channel mode change process and sends a
CHANNEL MODE MODIFY message to the terminal unit TU.
This command is transparent to the base transceiver
35   station BTS. Having received the CHANNEL MODE MODIFY
message, the terminal unit TU changes the channel mode
from signalling to voice and sends an acknowledgement

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to the access node AN with a CHANNEL MODE MODIFY ACK message. This message, too, is transparent to the base transceiver station BTS.

23.-24. The terminal unit TU is set to voice
5   mode by sending a CONNECT message to it. The terminal unit TU acknowledges this by sending a CONNECT ACK message. The subscriber now hears the ring-back tone from the local exchange LE.

25.-26. If the visitor location register VLR
10 of the access node does not recognise the temporary TMSI code, then the international mobile subscriber identity IMSI is requested by an IDENTIFICATION REQUEST message. In response, and IDENTIFICATION RESPONSE message is sent to the terminal unit TU.

15   27. The access node AN starts authentication by sending an AUTHENTICATION REQUEST message to the terminal unit TU.

28 The terminal unit TU sends a calculated response in an AUTHENTICATION RESPONSE message to the
20 access node AN.

The invention is not restricted to the examples of its embodiments described above, but many variations are possible within the scope of the inventive idea defined by the claims.

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CLAIMS

1. Procedure for setting up a call in a wire-
less local loop, which is based on mobile communica-
tion technology and in which terminal units (TU) are
5   connected via a radio link to an access node (AN) and
from the access node to a wired network local exchange
(LE) via a standard V5 interface and in which checking
functions consistent with a mobile communication
specification are carried out, c h a r a c t e r i s e d
10   in that, to accelerate call setup, checking functions
are carried out during voice mode connection of the
call.

2. Procedure as defined in claim 1, c h a r -
a c t e r i s e d in that subscriber terminal units (TU)
15   are connected to the access node via a radio link con-
sistent with the GSM specification; and that checking
functions are carried out, said functions comprising
change of the subscriber identity code (TMSI realloca-
tion), verification of the authenticity of the sub-
20   scriber (authentication) and/or verification of the
subscriber's equipment identity code (IMEI check).

3. Procedure as defined in claim 2, c h a r -
a c t e r i s e d in that the change of the subscriber
identity code is a TMSI reallocation consistent with
25   the GSM 04.08 4.3.1. standard.

4. Procedure as defined in claim 2 or 3,
c h a r a c t e r i s e d in that the verification of
subscriber authenticity is an authentication consis-
tent with the GSM 04.08. 4.3.2 standard.

30   5. Procedure as defined in any one of claims
2 - 4, c h a r a c t e r i s e d in that the verifica-
tion of the subscriber's equipment identity code is an
IMEI check consistent with the GSM 04.08. 4.3.3 stan-
dard.

35   6. Procedure as defined in any one of claims
1 - 5, c h a r a c t e r i s e d in that the V5 inter-

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face is a V5.2 interface consistent with the ETS 300
347-1 standard.

7. Procedure as defined in any one of claims
1 - 5, c h a r a c t e r i s e d in that the V5 inter-
face is a V5.1 interface consistent with the ETS 300
324-1 standard.

ABSTRACT

PROCEDURE FOR SETTING UP A CALL IN A WIRELESS LOCAL LOOP

Procedure for setting up a call in a wireless local loop, which is based on mobile communication technology and in which terminal units (TU) are connected via a radio link to an access node (AN) and from the access node to a wired network local exchange (LE) via a standard V5 interface and in which checking functions consistent with a mobile communication specification are carried out. To accelerate call setup, checking functions are carried out during voice mode connection of the call.

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FIG. 1

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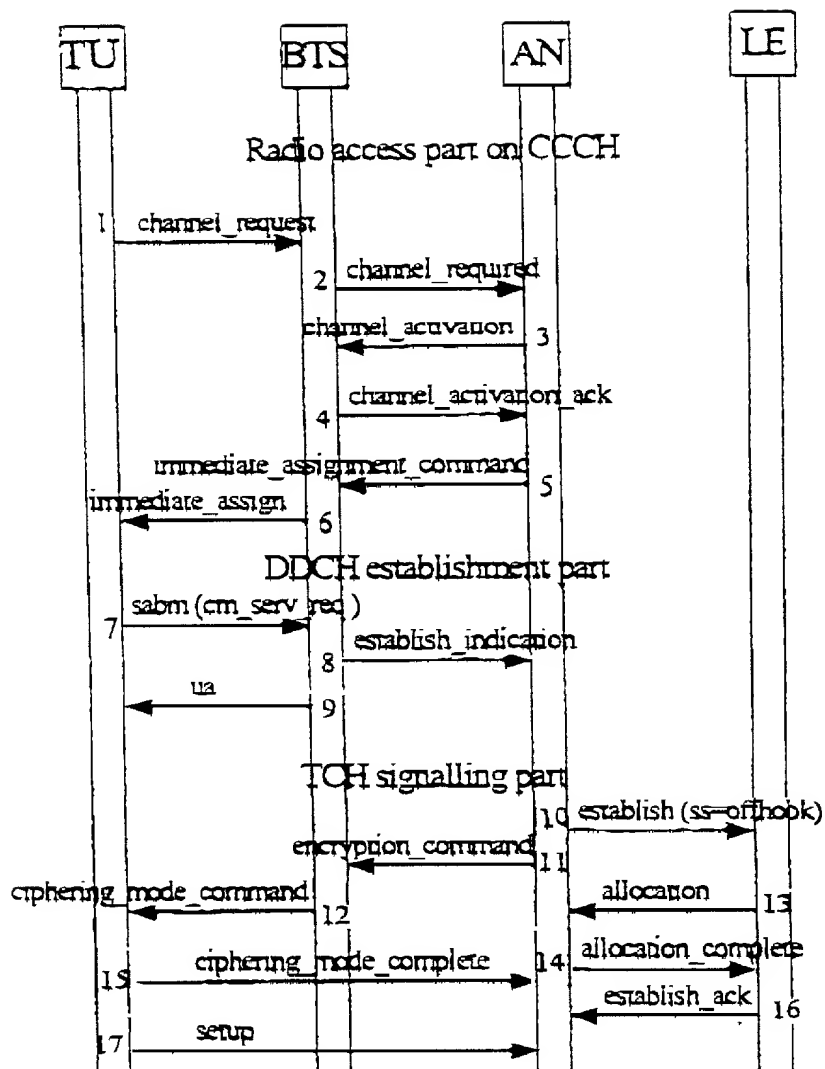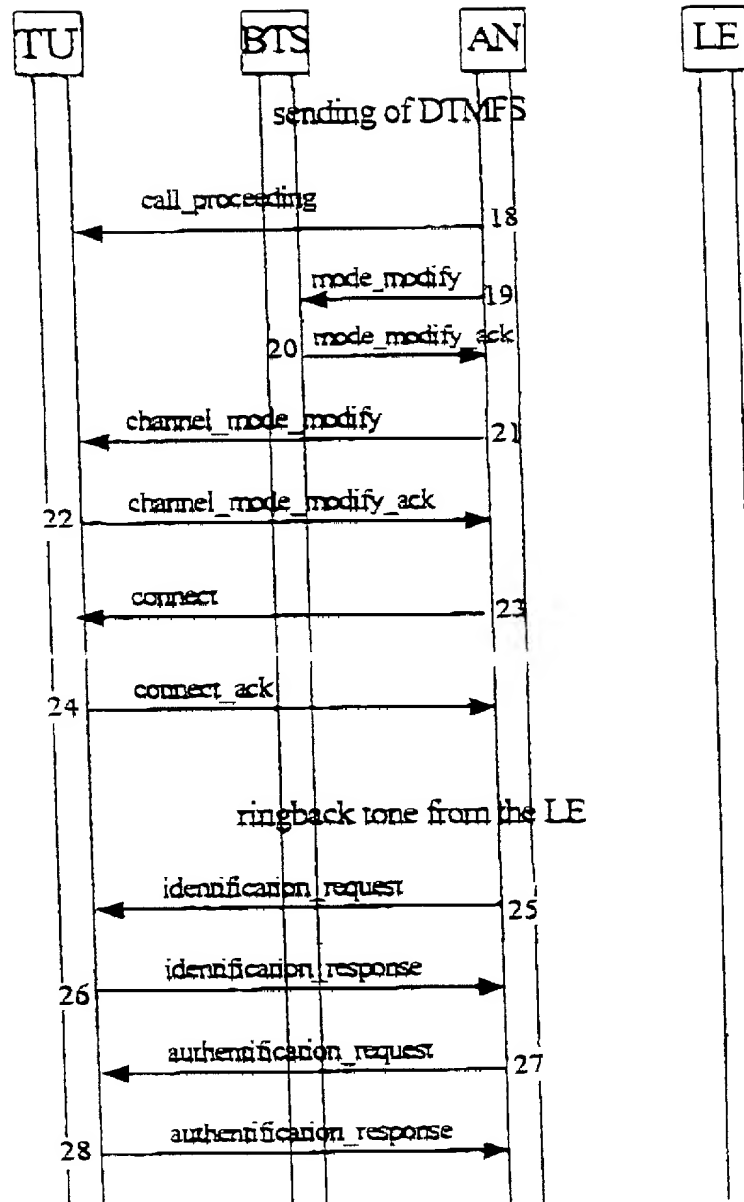FIG. 2

Altera Law Group, LLC

Declaration and Power of Attorney Patent Application
(Design or Utility)

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:
PROCEDURE FOR SETTING UP A CALL IN A WIRELESS LOCAL LOOP

the specification of which

☐ is referred to by Altera reference number on a separate document
☒ is attached hereto
☐ was filed on 29 February 2000 as application serial no. _____
    and or PCT International Application number   and was amended on   (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the U.S. Patent and Trademark Office all information know to me to be material to patentability as defined in 37 C.F.R.§1.56.

I hereby claim foreign priority benefits under 35 U.S.C.§119(a)-(d) or 35 U.S.C.§365(b) of any foreign application(s) for patent or inventor's certificate, or 35 U.S.C.§365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate of PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)		
Number 973579	**Country** Finland	**Day/Month/Year Filed** 1 September 1997
Number	**Country**	**Day/Month/Year Filed**
Number	**Country**	**Day/Month/Year Filed**

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below:

Prior Provisional Application(s)	
Serial Number	Day/Month/Year Filing Date
Serial Number	Day/Month/Year Filing Date
Serial Number	Day/Month/Year Filing Date

I hereby claim the benefit under 35 U.S.C. §120 of any United States application(s), or under 35 U.S.C. §365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. §112, I acknowledge the duty to disclose to the U.S. Patent and Trademark Office all information known to me to be material to patentability as defined in 37 C.F.R.§1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

Prior U.S. or International Application(s)		
Serial Number	Day/Month/Year Filed	Status (patented, pending, abandoned)
PCT/FI98/00654	25 August 1998	Pending
Serial Number	Day/Month/Year Filed	Status (patented, pending, abandoned)
Serial Number	Day/Month/Year Filed	Status (patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C.§1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Power of Attorney

As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

Steven R. Funk	Reg. No. 37,830	David W. Lynch	Reg. No. 36,204
Michael B. Lasky	Reg. No. 29,555	Karen D. McDaniel	Reg. No. 37,674
Iain A. McIntyre	Reg. No. 40,337		

I hereby authorize them or others whom they may appoint to act and rely on instructions from and communicate directly with the person/organization who/which first sends this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct Altera Law Group, LLC otherwise.

Please direct all correspondence in this case to Altera Law Group, LLC at the address indicated below:

Michael B. Lasky
Altera Law Group, LLC
10749 Bren Road East, Opus 2
Minneapolis, MN 55343

Full Name of Sole or First Inventor		
Family Name Rautiainen	**First Given Name** Jaakko	**Second Given Name**
Residence and Citizenship		
City of Residence Oulu	**State or Country of Residence** Finland	**Country of Citizenship** Finland
Post Office Address		
Street Address Tapiontie 5 A 5	**City** FIN-90570 Oulu	**State & Zip Code or Country** Finland
Signature of Inventor		**Date**